

Centralized Application Performance Testing:

Maturing Large IT Organizations

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Maturing Large IT Organizations**

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Executive Summary

Each year, hundreds of new projects are initiated within Fortune 1000 companies. Many of these projects are ambitious new applications designed to leverage the latest technology and compete in the marketplace. While the intent is to enable the business to grow, there is a huge risk introduced when multiple users begin accessing these applications. Large IT organizations are challenged with controlling this risk in the production environment. Performance testing minimizes this risk. However, proper testing requires resources with specific skill sets, and testing software that is flexible enough to meet the demands of the enterprise can be a significant investment.

Automated load, stress, and volume testing has proven to be effective at lowering the risk of rolling out bad performing applications. You can search the Internet for past news articles about those companies who failed to use these products and find plenty of examples. Even so, many larger companies still haven't maximized their investment because the testing process is not uniform across multiple lines of business (or LOB's). A few leading companies have chosen to centralize their resources around a Center of Excellence (COE) model for performance testing. Case studies from HP and research papers from organizations such as the META group have shown that this approach is the wave of the future. It allows for reduced cost, faster turn around for projects, and a repeatable experience in the testing process regardless of the project or platform.

In order for performance testing to mature within large IT organizations, the COE must evolve through a series of stages. A maturity model is available from HP, which also provides attributes of each stage. As a company strives to reach higher stages of maturity, more commitment is needed. It may require reorganization of people and infrastructure to align testing with the rest of the business. The COE must be flexible enough to adapt to various project requirements, outsourcing considerations, and other specific issues. But it should retain the core elements by which process improvement takes place.

To be perceived as successful, any Center of Excellence must have documented and recognizable value early on in its adoption. Those who start with a "service bureau" framework and an internal consulting service mindset from the beginning will see the biggest rewards. Fixing performance problems in a pre-production environment on projects with high visibility sets precedence for easy adoption early on.

Introduction

Today's CIO's are being asked to show the value of their IT organizations as a business unit. IT must improve delivery while reducing overall cost and must align itself with the goals of the business. This is because businesses rely on technology more than ever. Real-time information and automated business processes are crucial to the company's success. To remain competitive, companies must always look for new ways to leverage advances in technology, which increases complexity. With complexity comes an increase in the risk of defects and performance issues. The need for quality assurance (functional, performance, security, etc...) is needed now more than ever.

Fortunately, as web-based technology has advanced with other areas of IT, the software development lifecycle has become better defined and standardized. This has led to better processes being created for the development, testing, and production management phases for software. Yet not all companies are taking full advantage of these processes, because they simply don't know that they exist, or don't yet understand how to apply them.

Performance testing applications is one way to increase the overall quality of an application by identifying bottlenecks and making changes that will affect the speed and efficiency of the product. It allows companies to maximize infrastructure purchases and reduces of the risk of failing under times of heavy usage in production by knowing the limits of the application.

Over the last five years, an increasing number of companies have given more attention to the fact that performance testing is no longer an option. Not knowing how an application will perform in the real world can be a costly mistake. There is additional pressure applied by regulation agencies which expect compliance of audit requirements frameworks such as COBIT, FFIEC, HIPPA, and Sarbanes-Oxley. Many of these guidelines stipulate performance testing as part of an overall Quality Assurance program and part of the final acceptance criteria of a product.

For the large enterprise with dozens or hundreds of projects per year, the need of performance testing is so great that even multiple full time staff may not be able to keep up with the demand. Some departments may not even be aware that such personnel exist and may purchase their own testing tools and set aside additional resources for testing their specific project. This "recreation of the wheel" is even played out on a cyclical basis in some companies.

In July 2005, the Yankee group confirmed that the application load testing market is poised immense growth over the next few years, and expects companies to spend over \$500 million on load testing services in 2006.

Maturing the Performance Testing Process

Most companies are immature with regards to performance testing applications. Why? Because it normally requires someone with a niche skill set to create tests which produce accurate results. Such a person would have some level of expertise in virtually all areas of IT, including development, QA testing, infrastructure, database administration, and networking.

To determine maturity of performance testing in your company, find out why a test might be considered for a project today. Is testing implemented as a reactive measure to an unexpected problem? Are production service level agreements constantly in jeopardy of being broken with no known root cause? Is performance an afterthought until someone at the right management level starts complaining?

What does a company do when they've tested in the lab but still have a failure after release? Usually the blame is put on the testing tool itself, causing management to question the validity of the entire testing process. In reality, when applications in production fail under load even after implementing a testing process, it is due to one or more of the following:

- The company has assigned a person to do performance testing without consideration to their skill sets. Without the right skill set (and mind set) at the helm of the test methodology, a false sense of security can develop. Test results are trusted but the test conditions are invalid. This can cause a much bigger risk to the company because C-level executives believe they are making informed business decisions.
- The wrong roles are doing the performance testing, and trying to accomplish the wrong objectives. This could be functional QA testers who turn the performance test into a functional validation (how many defects per unit volume) when the infrastructure should be the focus. It could be developers who are only concerned with specific code components (perhaps their unit of code), and they do not test the application as an integrated product. Architects or other technical resources too close to the product can test according to their knowledge of the application without business knowledge or a view from the end users perspective.

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- The test environment looks nothing like production and the performance test results compare apples to oranges. Dangerous extrapolations can occur, like thinking that doubling the CPU's between environments can double performance. Applications are then "thrown over the wall" to operations who inherit the performance.
- Incomplete requirements, inaccurate business processes, and bad data are common roadblocks to performance testing. A test is only as good as the input on the front end of the process. Recreating reality is difficult without business processes knowledge. This can produce test results that can satisfy someone's personal agendas without actually revealing the real problems.
- Effective and controlled change management is not in place. Developers and other resources have the ability to make code or configuration changes to environments without documentation of those changes. These get moved to production without another performance testing cycle to validate the changes. This can cause performance issues to fall through the cracks in the software development lifecycle.

Figure 1 below displays a maturity model created for performance testing that allows for growth as an organization expands beyond a single line of business or a single department. Loadtester has adopted this model to establish maturity in process and methodology regarding application performance testing.

Performance testing maturity within a company can be classified into four stages:

- **Project Testing**
- **Product Utility**
- **Service Utility**
- **Performance Authority**

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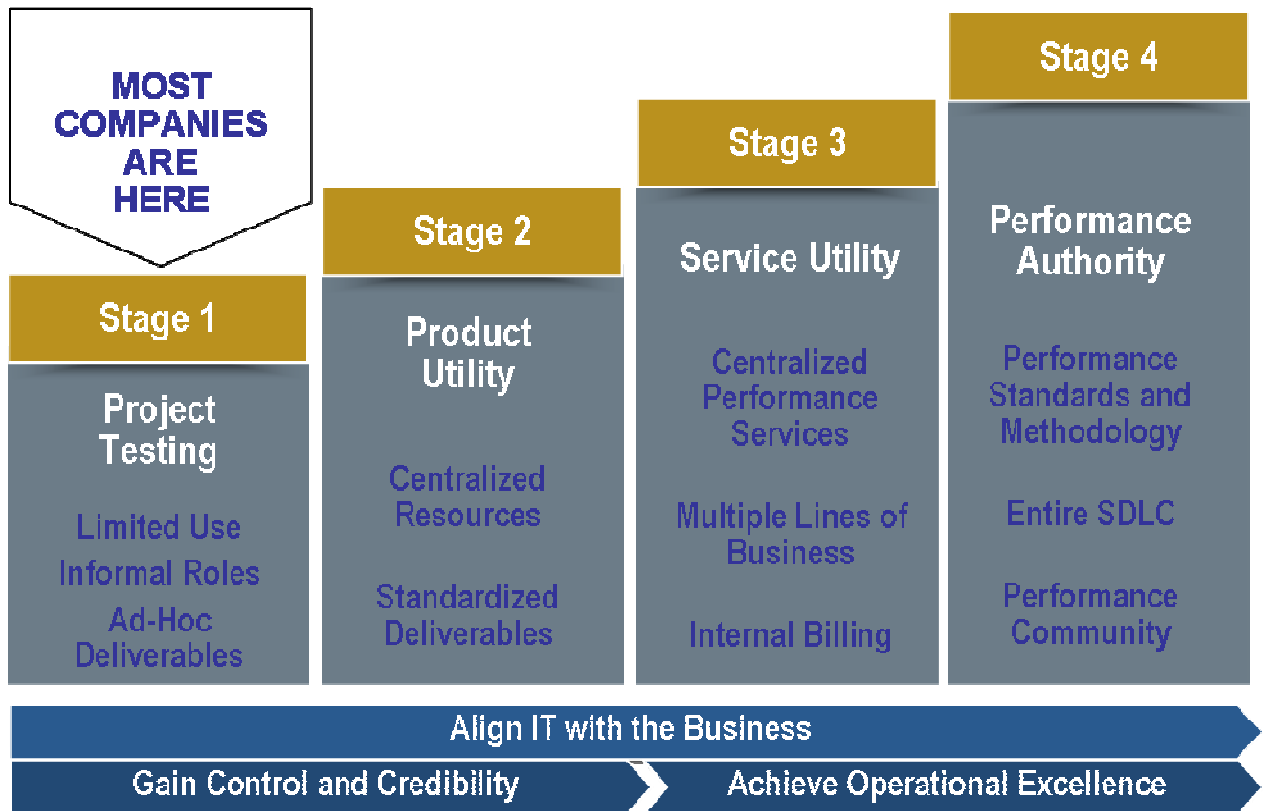


Figure 1 - Courtesy of HP -- recreated with permission

Stage 1 – Project Testing

The project testing stage is defined by having an ability to automate performance testing, but with the following limitations:

- Use of automation focused on one or few projects
- Informal roles or part-time resources for test execution
- Ad-Hoc deliverables
- Non-repeatable processes

Testing is executed on a few key projects but only just before the application rolls out to production. There is no way to determine if the application under test is exactly the same when it is rolled out to production as no change management is in place.

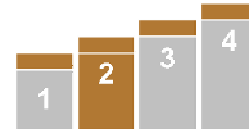
Only transaction times are used as metrics for performance. Application, system, and network monitors are not correlated with these measurements to get a true end-to-end view.

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Deliverables could be different for each project. If there are multiple groups who do performance testing for their own project, they do not communicate with each other. There is no standardization.

If the technology or platform changes (i.e. client-server to web) the processes are altered because they are done “on the fly”. Resources must be re-trained on their testing approach for each project because there is usually a time gap.

Stage 2 - Product Utility



People	Processes	Deliverables
<ul style="list-style-type: none">• Manager• Product administrator• Infrastructure administrator• Customer support• Perhaps leverage shared services group	<ul style="list-style-type: none">• Center management<ul style="list-style-type: none">– Charge back– Initial marketing– Project communication– Demand management• Administration<ul style="list-style-type: none">– Product administration– Infrastructure administration	<ul style="list-style-type: none">• Performance Center availability• Product support• Product utility service level reporting• Basic cross project performance reporting• Product utility marketing

Figure 2 - Courtesy of HP -- recreated with permission

Stage 2 – Product Utility

Moving to a product based function introduces two important capabilities:

It allows for testing to be done anytime, anywhere, by anyone with access
It allows multiple tests to be done on centralized infrastructure

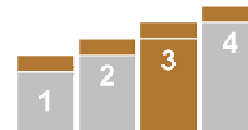
Resources (full or part time) are designated as users of the performance testing product. Documentation is standardized and reported to all stakeholders of a project. Scheduling use of the product is more formal and documented. As demand for more testing occurs, more resources and test execution

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infrastructure is acquired. Reorganization of resources to a centralized model begins at this stage. Other qualities include:

- 24x7 enterprise-wide testing infrastructures
- Management console and reports
- Resources scheduling
- Collaborative testing
- Development of best in class testing capabilities

Stage 3 - Service Utility



People	Processes	Deliverables
<ul style="list-style-type: none"> • Performance Testing Team <ul style="list-style-type: none"> – Center Manager – Project manager – Service coordinator – Technical architect – Performance engineers – Test environment manager 	<ul style="list-style-type: none"> • Center management <ul style="list-style-type: none"> – Enhanced demand management – Resource management • Project management • Performance validation • Performance optimization 	<ul style="list-style-type: none"> • Performance Validation and Optimization • Training and mentoring • Knowledge mgmt • Advanced cross project performance reporting • Service level reporting • Service marketing

Figure 3 - Courtesy of HP -- recreated with permission

Stage 3 – Service Utility

At the service utility stage, what has worked in the past with a product utility is expanded to multiple lines of business. The centralized model is expanded with formal leadership and roles. The central group acts as an internal consulting group to the Enterprise as needed. They also provide training and mentoring to local LOB resources so they are enabled to execute performance test on smaller components of an application. Projects are tracked and scheduled according to a formalized process. Executive management is aware of application performance at a high level across all tested projects at any time, not just when there is a problem. It includes the following elements:

- Testing services across multiple lines of business
- Processes: known standards, collaborative workflows
- Project management
- Internal billing capabilities
- Dashboard: visibility into project status
- Web-Enabled, Collaborative testing

Stage 4 - Performance Authority

People	Processes	Deliverables
<ul style="list-style-type: none">• Standards and methodology group<ul style="list-style-type: none">– Manager– Process architect– Process specialist– Technical writer– Compliance auditor– Customer support	<ul style="list-style-type: none">• End to end performance engineering• Standards enforcement• Formalized process improvement	<ul style="list-style-type: none">• Organizational and performance standards• Expert performance services• Advanced training and mentoring• Organizational knowledge mgmt• Organizational performance reporting• Organizational education

Figure 4 - Courtesy of HP -- recreated with permission

Stage 4 – Performance Authority

According to HP statistics, the performance authority stage represents less than 1% of the companies who currently do performance testing throughout the software development lifecycle (2005). This level of maturity can take years and many organizational changes to develop. It requires that a specific group from within the company make final decisions for production implementation based on performance results. This requires results that are trustworthy to make business decisions on, indicating a very mature, organized, and thorough testing team. Performance is engineered into all products throughout the entire SDLC.

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Performance metrics are tied into IT Governance metrics and tightly integrated into the IT Governance process. It includes the following characteristics:

- Standardized services and metrics based on best practices
- Real-time visibility and end-to-end traceability
- Knowledge / expertise sharing
- Centralized management and authority (approval)
- Testing community

The Monsters

When performance testing becomes an organizational push from Quality Assurance organizations, there is a natural tendency to push back. Many departments do not understand how they are affected by this change, so the immediate reaction is to resist. Security does not want to be told that access levels have to be accommodated. Development teams do not want to be locked out of a system for long periods of time. And just exactly who is the person responsible for creating thousands of test users accounts in preparation for a test?

These are the new challenges that are revealed once enterprise-wide performance testing begins. We refer to these challenges as “the monsters in the corner” because they can scare some companies away from proper test methodology. A monster might be security concerns because of access needed to monitor systems during the testing period. It could be a maze of forms and paperwork that needs to be filled out and approved, drastically lengthening test engagements. It may be that there is no support from various groups to help determine and fix specific bottlenecks.

When it comes to implementing a Performance COE across multiple lines of business, one of the biggest obstacles is getting past organizational impacts. This is why it is important to bring in resources that are not only familiar with the performance testing product, but understand the complexities of the organizational change that must happen to be successful. Loadtester consultants are trained to be “monster” killers, and ease some of the pain in dealing with these new challenges as they are recognized. We’ve been there before.

The Performance Center of Excellence

A center of excellence always starts with the right resources, not just a lot of headcount. A performance COE starts with engineers who are passionate about performance and have a solid reputation for using best of breed processes. A

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solid methodology is customized within the organization depending on their needs. There is an incubation period where this new department (or set of resources) must prove out their value. The team should focus on the projects that are in need of saving, or “key wins”. These are projects where performance testing methodology can truly shine. The “center” officially begins when that organization becomes recognized as a magnet for drawing other organizational units to it. After a few key wins, and the open marketing that follows, it won’t take long for other projects in jeopardy to beat down the doors of the COE, looking for help.

Unfortunately this kind of trust can take a long time to develop. Loadtester can be used as catalysts to jump start and develop a COE initiative. It usually starts with an IT assessment of all lines of business through an interview and audit procedure. This is followed by a risk analysis and gap analysis study. The deliverables produced from this process include a full assessment of the current state of IT, and what needs to happen for the company to move on to the next stage of maturity. Because of our experience developing COE’s in some of the largest companies in the world, Loadtester understands the pitfalls and roadblocks that prohibit organizational change and what it takes to help the organization move forward.

A Performance COE provides many benefits, including:

- Centralized Resources (people, infrastructure, software licenses)
- Repeatable Process
- Audit and Controls

According to the META group, A Performance COE should deliver:

- Performance Testing – testing the scalability and performance of an application
- End-to-end views of business process performance – not just availability
- Diagnostics for inspecting internal components of applications to identify slowdowns
- Capacity Planning including simulating “what if” scenarios
- Assessment of current environment use and strategies for improvement.

Is this where you are looking to take your organization?

Documenting and Recognizing Value

To document the value of performance testing, walk through a testing exercise with a qualified performance engineer. Determine what was done and how a bottleneck was alleviated. A final deliverable should demonstrate what the performance was before the testing began, what bottlenecks were found, and what the performance is now that those issues have been addressed. As a CIO, how much is it worth to the organization to have found and resolved this issue before it reached production? What would it cost in terms of support for the product and risk to the enterprise if there were a failure in production with that same bottleneck? Account for the monitoring systems, and the man hours needed to reactively fix that performance bottleneck. This leads one to the conclusion that *any* performance testing is worth it.

How much more valuable is performance testing when there are multiple lines of business with multiple projects each, all doing performance testing in the same way and correcting serious bottlenecks many times over?

To measure the impact at the project level and at the enterprise level, start with some relatively high level Key Performance Indicators (KPI's). At the project level, it could be as simple as:

“Before testing, web page views took 12 seconds. After testing, they take 3 seconds”. Multiply the time savings and account for less user abandonment.

At the enterprise level, it might be:

“Before implementing a performance testing process we were happy with 15 second login times for our applications. Now we consider 5 seconds to be too long because most of them fall under this time frame.” This is because more applications have been optimized and the average expectation times are going down. This goes a long way to showing that user experience is important to company.

Success Breeds Success

Once a department defines and acts on a solid performance testing methodology and sees levels of success, other departments will want to be included in the process to improve their application. A champion is needed to focus the overall company on sharing the knowledge, standardizing on documentation, and

moving out beyond a single line of business. A center of excellence is developed as success is “cloned” throughout the enterprise. It is important to distinguish this from simply some new process that is being shoved out to other departments without their inclusion.

HP’s Performance Center Product

A center of excellence hinges on the right product to support the methodology. No other product on the market is aligned for use in an Enterprise-wide COE as HP’s Performance Center. Instead of using multiple Controllers on separate machines, it uses a browser based solution to provide access anywhere, anytime. All of the features within LoadRunner are available with Performance Center, making it flexible and familiar to performance engineers who have used HP’s products in the past. Additional administration and management ensure that all users get the appropriate level of access to the product, providing the ability to operate it like any other production ready system.

Loadtester uses HP performance testing products like LoadRunner and Performance Center *exclusively*. We believe that HP provides the most complete solution for performance testing in any environment and allows the greatest flexibility in terms of the application platforms it supports.

With Performance Center, HP has created a scalable Enterprise-ready solution that makes it easy for multiple lines of business to leverage the same resources, keeping long term costs low. It also allows for a company like Loadtester to teach solid performance testing methodology that is both reproducible and agile enough to meet each company’s individual needs.

Achieving Excellence

As mentioned earlier, excellence in performance testing depends on the right people using the right tools. Analyze who is doing the testing now and determine if they are the right candidate. Do they have passion for performance, or is testing viewed as a necessary evil? Is it simply part of a bigger checklist, or is there concern about the users experience when they see the finished product? Are they always looking for new ways to use the testing products to get more value from them?

Forming a COE around performance testing takes vision. Look at the present and then chart a course for the future. A practical way to begin is to document what is being done today and find things that would not scale within a COE.

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Begin to modify daily processes with a finished COE in mind. There must be commitment to these processes to ensure they remain useful. Don't be afraid to modify processes as the organization learns and matures.

Focus On Key Services First

Implementing too many services at once leads to chaos. Performance Center was designed by HP to be a suite of components that would allow companies to handle every aspect of application performance. While the first inclination might be to bite off everything in one pass, this is usually not the best course of action. Loadtester recommends limiting the scope of the COE to validation services during the initial stages. This allows testing resources to become familiar with new processes and standards. Over time it will be evident what works best within the company. Add additional optimization services like tuning and deep diagnostics when its time to expand. As the organization matures, performance can be addressed earlier and earlier into the software development lifecycle. Capacity Planning services can be used to plan for new or additional hardware purchases based on past testing, allowing for smarter purchases before they happen. At this point, performance is being thought about before hardware is purchased, and is being considered throughout the entire implementation of the project. Performance Center allows companies to add additional services as they can be digested.

Figure 5 below shows the various components that make up Performance Center:

HP Performance Center

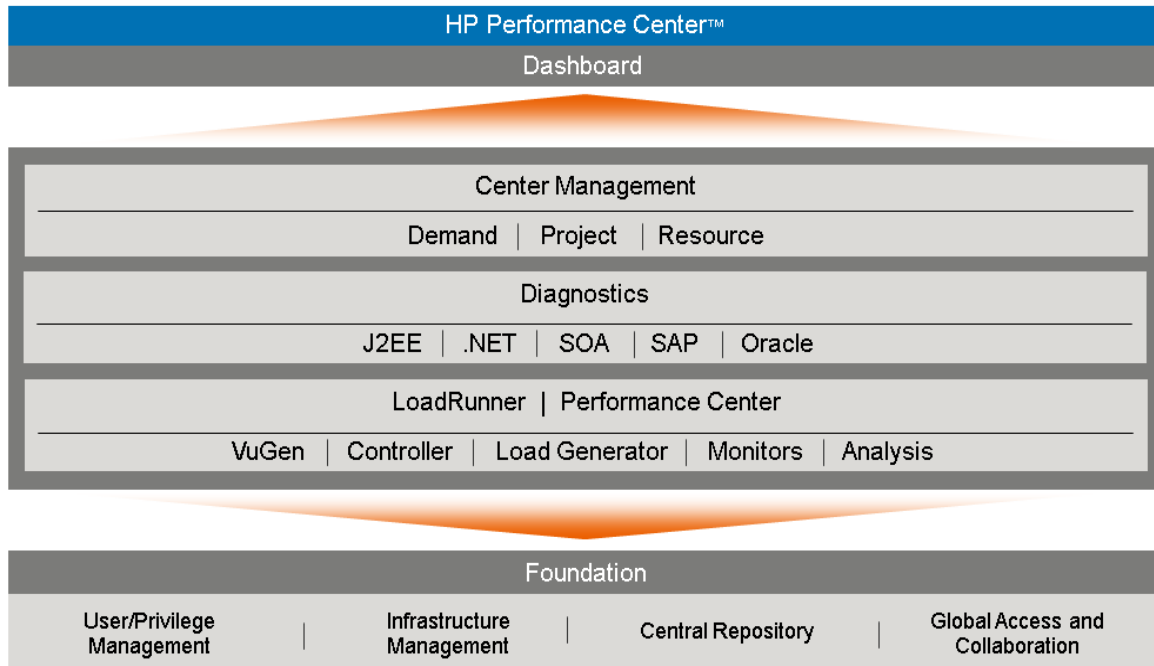


Figure 5 – Performance Center - Courtesy of HP -- recreated with permission

Openly Market Results

Even with the best performance testing team resources and solid methodology that fixes every bottleneck and eliminates every risk, a COE would be hard to develop if no one knew about it. Marketing is an important part of a successful COE, especially in the early stages. Obviously you have to be able to back up any claims, but you have to stake a claim first. During the incubation stage when those “key wins” are being worked on, there should be a plan in place to market the results when things are found. Not for the sake of exposing someone’s configuration or coding mistake, but to show the value of finding a problem early. Never focus on who was wrong, but what was right about testing the product. Focus on the fact that the user never has to experience time delays because of what was found during testing. As you roll out performance center, set aside a date when it is officially launched to have your IT department stop by the area and meet all of the performance engineers, and give demonstrations of the product. Performance Engineers can host “lunch and learns”. Everyone in the department becomes a salesman for the COE. Word of mouth still works wonders.

Expand Services

As mentioned before, you can take on additional services when you are ready. It is important to invest in the testing engineers and take them up to the next level before expanding the service. If they are not HP certified, this is great time to start that process. Once certified, there is additional training for the other modules of performance center. Tuning can require a level of expertise equivalent to the development team and database administrators. Training in the technologies they are testing (JAVA, Oracle, etc) will help as well. At some point the central performance engineers will be as familiar with the code as some developers. They will understand the performance capabilities of the application better than anyone. This allows further movement towards becoming a performance authority.

Continuous Process Improvement

As you expand services to include tuning and capacity planning, ensure that the processes are also expanding and being documented. Ensure that your processes can continue to scale. According to CMM Level 5 Generic Practice 5.1, “Optimizing processes that are agile and innovative depends on the participation of an empowered workforce aligned with the business values and objectives of the organization. The organization’s ability to rapidly respond to changes and opportunities is enhanced by finding ways to accelerate and share learning. Improvement of the processes is inherently part of everybody’s role, resulting in a cycle of continual improvement.”

In short, optimize your own load testing processes so that it can be done more efficiently the next time. This can be as simple as moving away from spreadsheets and paper surveys and over to web based input forms which automates requirement gathering. Being part of a Center of Excellence means a commitment to excellence, while always trying to make things more efficient.

Use Valued Outsourcing Companies

Yankee Group Research published a report in July 2005 about the trends in the application load testing market. It mentions the need for valued consultants. "Value Outsourcers compete based on skills, not on the ability to cheaply deliver a commodity IT service. ...Valued outsourcers need to embrace automation and implement a set of repeatable processes for the application development lifecycle." This is what Loadtester excels at, and continues to improve upon.

Summary

As the Enterprise gets more complex, it must mature in order to ensure high performing applications. Part of that maturity involves centralizing performance testing resources no matter their physical location. HP provides support for this with the release of their Performance Center product.

Centralizing is part of moving towards a Center of Excellence model. This requires a hard look at the IT organization, determining what standards should be implemented and where they should come from. It requires vision, and a commitment to that vision. It requires processes that scale beyond a one person team. Start by documenting the way it is today and chart a course for where you want to be tomorrow.

A performance center of excellence requires a commitment to engineer performance into applications throughout the entire software development lifecycle. Loadtester specializes in helping large organizations putting together the pieces of this complicated puzzle.

Appendix A – References

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About Scott Moore

With over 15 years of IT experience with various platforms and technologies, Scott has performance tested some of the largest applications and infrastructures in the world. He has developed a performance Center of Excellence for multiple large enterprises. Scott is the president of Loadtester Incorporated.

About Loadtester Incorporated

Loadtester is a leading provider of services around application performance testing and creating Performance Centers of Excellence. We teach companies how to engineer performance into the software development lifecycle. As a HP Business Partner with HP Certified Consultants on staff, we have the qualifications to implement HP products into your organization. We are also an authorized HP reseller. Visit www.loadtester.com to find out more information about our services and offerings.

About HP

HP is a technology solutions provider to consumers, businesses and institutions. HP software helps IT organizations make sure that every dollar delivers positive business outcomes. Their business technology optimization (BTO) products automate key processes across IT functions, and their OpenCall platforms enable people to communicate and access services. As the focus of IT shifts from systems management to business results, companies are investing in HP software to lower costs, improve delivery time and reduce risk.